

pulse generator means for generating and delivering pacing pulses to control the beat rate of a patient's heart; and

rate control means for controlling a pacing rate of said pacing pulses, said rate control means further comprising:

respiration means for obtaining respiration signals representative of a patient's respiration, and modulation means for developing rate modulation signals for controlling said pacing rate to change as a function of said respiration signals and to increase during a patient's inspiration phase relative to the pacing rate during a patient's expiration phase, wherein said modulation means comprises amplitude means for controlling an amplitude of pacing rate change and timing means for controlling the timing of said pacing rate change relative to the patient's inspiration phase and the expiration phase of said patient's respiratory cycle. [The system as described in claim 5,] wherein said amplitude means comprises cardiac work means for determining a measure of cyclical cardiac work and for controlling said amplitude as a function of said work measure.

7. (twice amended) A system for respiration modulated pacing, comprising:

pulse generator means for generating and delivering pacing pulses to control the beat rate of a patient's heart; and

rate control means for controlling a pacing rate of said pacing pulses, said rate control means further comprising:

respiration means for obtaining respiration signals representative of a patient's respiration, and modulation means for developing rate modulation signals for controlling said pacing rate to change as a function of said respiration signals and to increase during a patient's inspiration phase relative to the pacing rate during a patient's expiration phase, wherein said modulation means comprises amplitude means for controlling an amplitude of pacing rate change and timing means for controlling the timing of said pacing rate change relative to the patient's inspiration phase and the expiration phase of said patient's respiratory cycle. [The system as described in claim 5,] wherein said amplitude means comprises

volume means for determining a measure of the end-diastolic volume of a ventricle of said patient and for controlling said amplitude as a function of said volume measure.

8. (twice amended) A system for respiration modulated pacing, comprising:

pulse generator means for generating and delivering pacing pulses to control the beat rate of a patient's heart; and

rate control means for controlling a pacing rate of said pacing pulses, said rate control means further comprising:

respiration means for obtaining respiration signals representative of a patient's respiration, and modulation means for developing rate modulation signals for controlling said pacing rate to change as a function of said respiration signals and to increase during a patient's inspiration phase relative to the pacing rate during a patient's expiration phase, wherein said modulation means comprises amplitude means for controlling an amplitude of pacing rate change and timing means for controlling the timing of said pacing rate change relative to the patient's inspiration phase and the expiration phase of said patient's respiratory cycle. [The system as described in claim 5,] wherein said amplitude means comprises pressure means for determining a measure of the blood pressure relating to a ventricle of said patient and for controlling said amplitude as a function of said blood pressure measure.

10. (twice amended) A system for respiration modulated pacing, comprising:

pulse generator means for generating and delivering pacing pulses to control the beat rate of a patient's heart; and

rate control means for controlling a pacing rate of said pacing pulses, said rate control means further comprising:

respiration means for obtaining respiration signals representative of a patient's respiration, and modulation means for developing rate modulation signals for controlling said pacing rate to change as a function of said respiration signals and to increase during a patient's inspiration phase relative to the pacing rate during a patient's expiration phase, wherein said modulation means

comprises amplitude means for controlling an amplitude of pacing rate change and timing means for controlling the timing of said pacing rate change relative to the patient's inspiration phase and the expiration phase of said patient's respiratory cycle, wherein said amplitude means comprises maximum rate change means for limiting the amplitude of pacing rate change during the respiratory cycle. [The system as described in claim 9,] wherein said maximum rate change means comprises body position sensor means for sensing [the] a patient's body position and for limiting said amplitude or pacing rate change as a function of said sensed body position.

11. (twice amended) A system for respiration modulated pacing, comprising:

pulse generator means for generating and delivering pacing pulses to control the beat rate of a patient's heart; and

rate control means for controlling a pacing rate of said pacing pulses, said rate control means further comprising:

respiration means for obtaining respiration signals representative of a patient's respiration, and modulation means for developing rate modulation signals for controlling said pacing rate to change as a function of said respiration signals and to increase during a patient's inspiration phase relative to the pacing rate during a patient's expiration phase, wherein said modulation means comprises amplitude means for controlling an amplitude of pacing rate change and timing means for controlling the timing of said pacing rate change relative to the patient's inspiration phase and the expiration phase of said patient's respiratory cycle, wherein said amplitude means comprises maximum rate change means for limiting the amplitude of pacing rate change during the respiratory cycle. [The system as described in claim 9,] wherein said maximum rate change means comprises heart rate means for determining a measure of [the] a patient's heart rate and for limiting said amplitude or pacing rate change as a function of said heart rate measure.

14. (twice amended) A system for respiration modulated pacing, comprising:

pulse generator means for generating and delivering pacing pulses to control the beat rate of a patient's heart; and

rate control means for controlling a pacing rate of said pacing pulses, said rate control means further comprising:

respiration means for obtaining respiration signals representative of a patient's respiration, and modulation means for developing rate modulation signals for controlling said pacing rate to change as a function of said respiration signals and to increase during a patient's inspiration phase relative to the pacing rate during a patient's expiration phase [The system as described in claim 1.] further comprising means for determining a measure of patient activity, and inhibit means for inhibiting said modulation means from changing said pacing rate as a function of respiration signals when said activity measure exceeds a predetermined reference level.

22. (once amended) A system for pacing a patient's heart, comprising:

pulse generator means for generating and delivering pace pulses to said heart;

rate control means for controlling a pacing rate at which said

pulse generator means generates and delivers pace pulses;

respiration means for obtaining respiration signals representative of a patient's respiration, and

said rate control means comprising modulation means for modulating said pacing rate as a function of said respiration signals, [The system as described in claim 18,] further comprising power means for determining a measure of cardiac power output, and wherein said modulation means further comprises means for adjusting pacing rate as a function of said cardiac power output measure.

23. (twice amended) A system for pacing a patient's heart, comprising:

pulse generator means for generating and delivering pace pulses to said heart;

rate control means for controlling a pacing rate at which said

pulse generator means generates and delivers pace pulses;

respiration means for obtaining respiration signals representative of a patient's respiration, and

said rate control means comprising modulation means for modulating said pacing rate as a function of said respiration signals, [The system as described in claim 18,] further comprising activity means for obtaining activity representations of patient activity or position, and wherein said modulation means further comprises means for adjusting pacing rate as a function of said activity representations.

24. (twice amended) A system for pacing a patient's heart, comprising:

pulse generator means for generating and delivering pace pulses to said heart;

rate control means for controlling a pacing rate at which said

pulse generator means generates and delivers pace pulses;

respiration means for obtaining respiration signals representative of a patient's respiration, and

said rate control means comprising modulation means for modulating said pacing rate as a function of said respiration signals, [The system as described in claim 18,] further comprising pressure means for obtaining pressure representations of the patient's ventricular pressure, and wherein said modulation means further comprises means for adjusting pacing rate as a function of said pressure representations.

25. (twice amended) A system for pacing a patient's heart, comprising:

pulse generator means for generating and delivering pace pulses to said heart;

rate control means for controlling a pacing rate at which said

pulse generator means generates and delivers pace pulses;

respiration means for obtaining respiration signals representative of a patient's respiration, and

said rate control means comprising modulation means for

modulating said pacing rate as a function of said respiration signals. [The system as described in claim 18,] further comprising volume means for obtaining volume representations of the patient's ventricular volume, and wherein said modulation means further comprises means for adjusting pacing rate as a function of said volume representations.

34. (twice amended) A method of pacing a patient to provide a respiration-modulated heart rate, comprising:

obtaining respiration signals representative of the inspiratory and expiratory phases of the patient's respiratory cycle,

generating phasic rate control signals as a function of at least one of said inspiratory and expiratory phases,

generating stimulus pulses at a rate controlled by said phasic rate control signals, and

delivering said phasic rate controlled stimulus pulses and to pace the patient's heart at a relatively higher rate during said inspiratory phase compared to said expiratory phase. [The method of pacing as described in claim 31,] further comprising the steps of obtaining volume signals representative of the patient's right ventricular volume, and generating said phasic rate control signals as a function of said volume signals.

35. (twice amended) A method of pacing a patient to provide a respiration-modulated heart rate, comprising:

obtaining respiration signals representative of the inspiratory and expiratory phases of the patient's respiratory cycle,

generating phasic rate control signals as a function of at least one of said inspiratory and expiratory phases,

generating stimulus pulses at a rate controlled by said phasic rate control signals, and

delivering said phasic rate controlled stimulus pulses and to pace the